

AP16151

XC2000/XE166

Basic on System Test Code Controlled Via
Hyper Terminal/MTTTY

Microcontrollers



Never stop thinking

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1 Introduction

This application note describes how to setup and use the XC2000/XE166 test code. This test code is useful for new HW prototype especially when actual code is not available. It is benefit for the system engineer or hardware engineer to verify basic microcontroller functionality and continuity tests of their board. The code is controlled via Hyperterminal or MTTY. The test code is able to:

- Configure the Port Pins to Input or Output
- Set any Port Pin to High or low
- Read any Port Pin
- Toggle any Port Pin to certain frequencies
- Read all the ADC channels
- Measure frequency
- Read 16 bits data from any address (full Memory Map)
- Write 16 bits data to any address (full Memory Map)
- Enable the external crystal oscillation

As different projects would have different Pin configuration, a script loading method is provided to load and initialize the pins to Input or Output and set the initial Output value.

1.1 Purpose

The purpose of this note is to introduce the features, setup and use of the test code.

1.2 Scope

This note addresses the following requirement and features

- Hardware System setup
- Communication Protocol and requirement
- Initial condition of the system
- System Requirement
- Start up
- Usage of the commands
- Script loading

This note is applicable for 100pins and 144pins package of **XC22xx, XC23xx, XC27xx and XE16x** family which include:

- **xxx-XC2x6x-xxFxxL-xx, xxx-XC2x8x-xxFxxL-xx,**
- **xxx-XC226xM-xxFxxL-xx, xxx-XC228xM-xxFxxL-xx**
- **xxx-XC236xA-xxFxxL-xx, xxx-XC238xA-xxFxxL-xx**
- **xxx-XC2765X-xxFxxL-xx, xxx-XC2785X-xxFxxL-xx**
- **SAF-XE167x-xxFxxL-xx, SAF-XE167xM-xxFxxL-xx**
- **SAF-XE164x-xxFxxL-xx, SAF-XE164xM-xxFxxL-xx**

2 Hardware Setup

The test code makes use of the ASC protocol to perform the testing. USIC0 channel 0 is assigned for communication. The test code supports LIN or RS232. However, the protocol has to be in ASC. The protocol setup is as follows: UART / ASC, 19200bps, No parity, 8 bits, 1 stop bit., No HW/software flow control. If the design already has a LIN transceiver then LIN can be used for communication with a LIN to RS232 transceiver. If not, ASC to RS232 transceiver is recommended. See Appendix for recommended schematics of these.

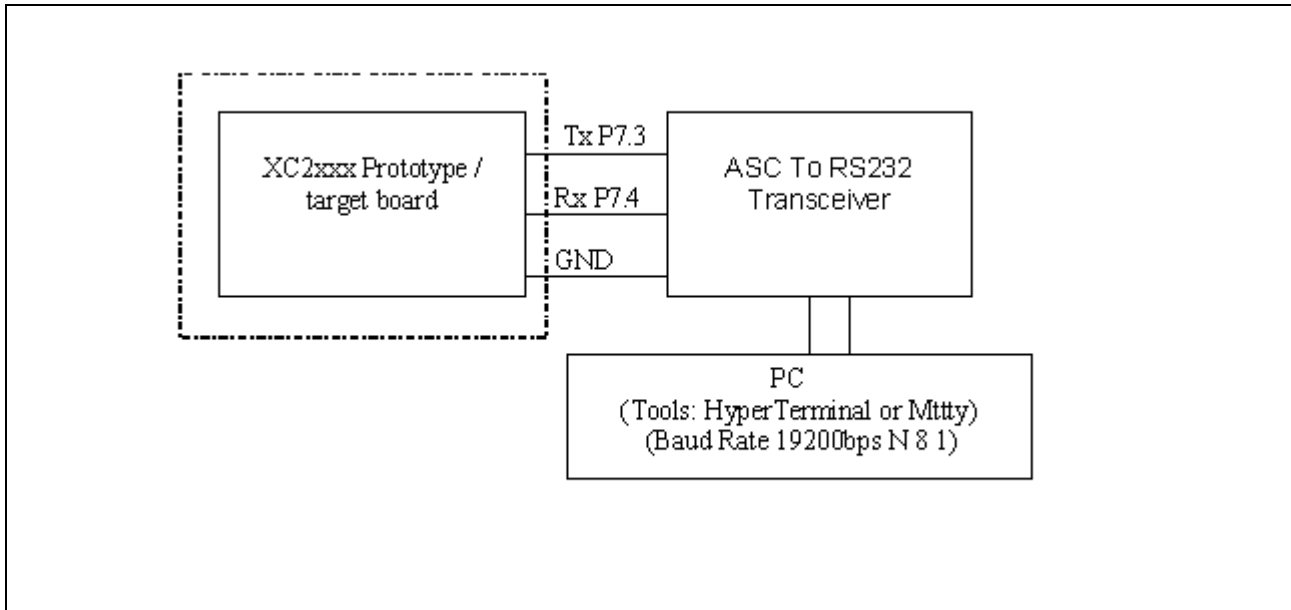


Figure 1 Test Setup Using ASC

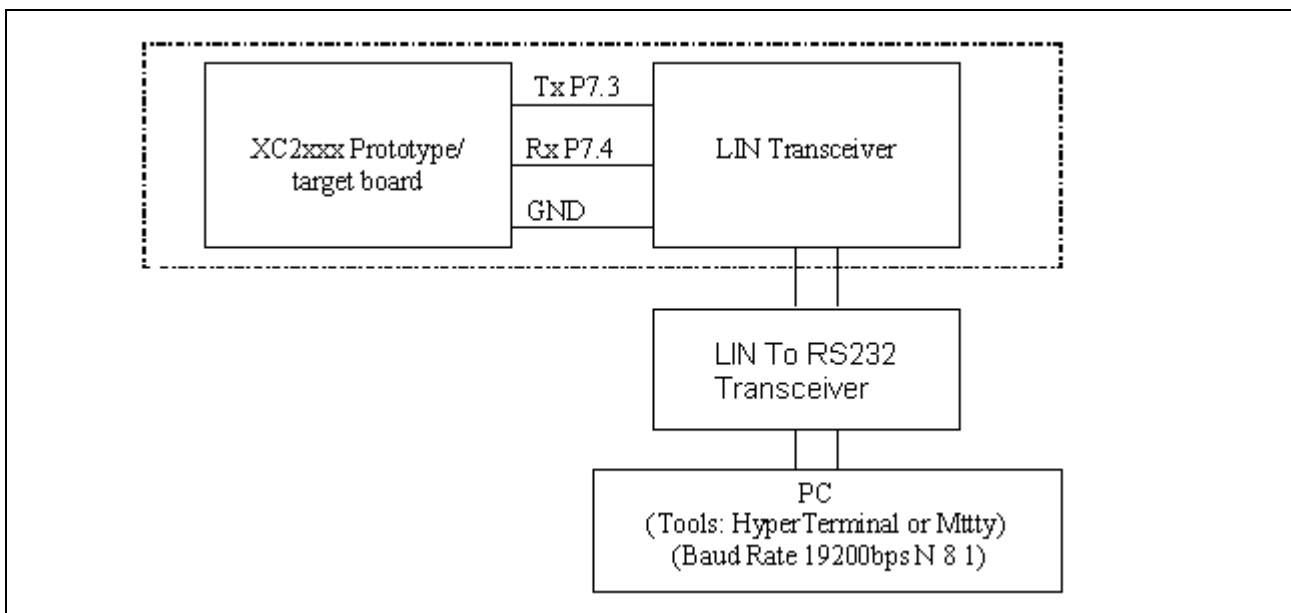


Figure 2 Test Setup Using LIN

2.1 System Requirements for Target Board

The Target board shall support the ASC Boot mode (USIC0 channel 0, P7.3/P7.4)

A) Bootstrap loader Startup Configuration for –xxx-XC2xxx-xxFxxL-xx and SAF-XE16xx-xxFxxL-xx.

→ P10.0 = 0, P10.1 = P10.2 = 1, P10.3 /TRST = X

B) Bootstrap loader Startup Configuration for –xxx-XC22xxM-xxFxxL-xx,
 –xxx-XC23xxA-xxFxxL-xx, –xxx-XC27x5X-xxFxxL-xx and SAF-XE16xxM-xxFxxL-xx.

→ P10.0 = 0, P10.1 = P10.2 = 1, TRST = 1

2.2 Start Up

Use the MEMTools to load the test software. For details, please refer to the XC2000/XE166 Easy Kit User Manual, or use the debugger through JTAG to load the test software.

The system clock of test software is initially running at 10 MHz from PLL locking on the internal clock source OSC_LP (5MHz). The “X” command is to switch the clock source from OSC_LP to the external crystal Osc.

After configure and connection to the Hyper Terminal or MTTTY with test software, the following message should be sent out from the board under test.

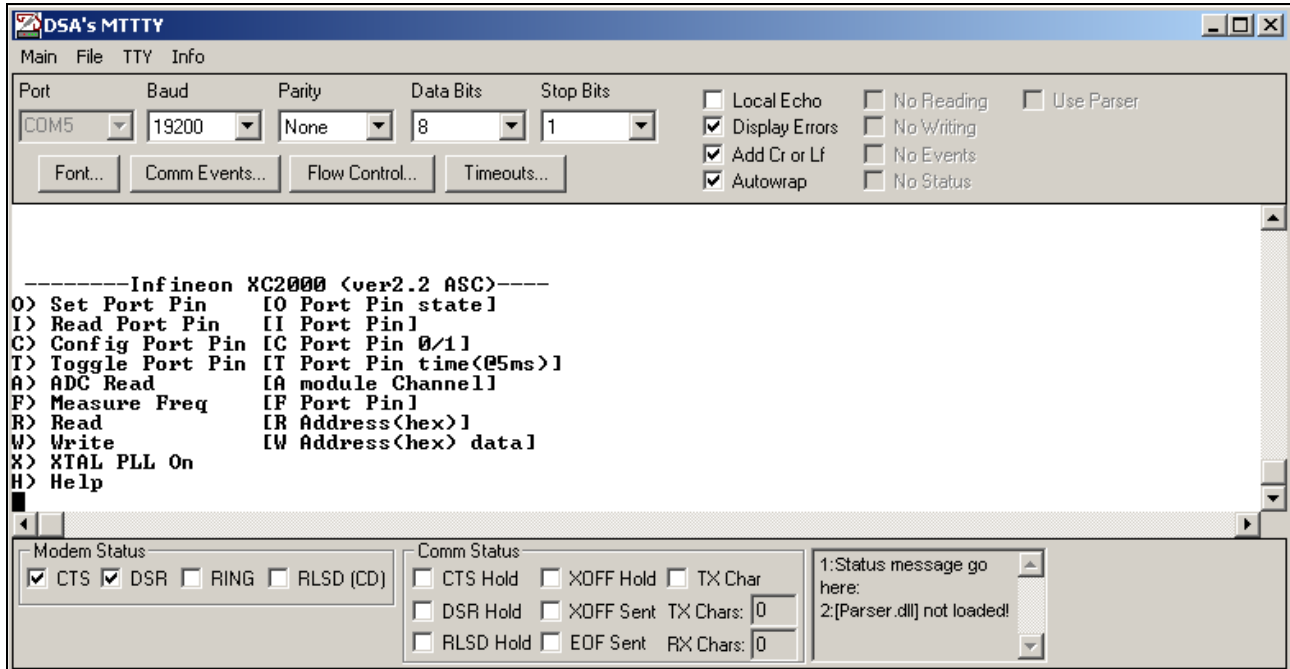


Figure 3 Hyper Terminal Screen.

2.3 Initial Condition of the Test Code

- All IO is set as Input (the same as the HW reset settings)
- All ADC channels are enabled
- The system clock is running at 10MHz from PLL locking on the internal clock OSC_LP (5MHz)
- P7.3 and P7.4 are configured for ASC protocol for 100pin and 144pin package

3 Usage

3.1 Output Command

O Port Pin State

Port - Port number
Pin - Pin number
State 1: High , 0: Low

E.g. O 10 0 1 → Set port 10 Pin 0 to High

3.2 IO Config Command

C Port Pin 0/1

Port - Port number
Pin - Pin number
0/1 - 1 – Input, 0 – Output

E.g. C 10 0 0 → Configure port 10 Pin 0 to Output

3.3 Read Input Command

I Port Pin

Port - Port number
Pin - Pin number

E.g. I 10 0 → Read the Port 10 Pin 0 state

3.4 Toggle Output Command

T Port Pin time multiply by 5ms

Port - Port number
Pin - Pin number
Time – time for toggle

E.g. T 10 0 10 → Toggle the Port 10 Pin 0 at every 50ms

3.5 ADC Read Command

A Module Channel

Module – Module 0, or 1
Channel - Channel number

E.g. A 0 15 → Read the ADC value of Module 0, Channel 15
Module 0, channel 0, adc 0x02b2 (3369 mV)

3.6 Measure Frequency

F Port Pin

Port - Port number

Pin - Pin number

E.g. F 0 1 → Read the Duty, Freq, Period of the selected Pin

Duty Cycle 49.99(percent), Period 99988.53(us), Freq 10.00(Hz)

Remark: As the measurement method is using polling, the accuracy of high frequencies may not be good. This just provides a rough estimation.

3.7 Read the Memory Location / SFR

R address

Address – Full range of Memory map

E.g. R C00000 → Read the Flash location 0xC00000

E.g. R E820 → Read P1 IOCR register

3.8 Write to the Memory Location / SFR

W address value

Address – Full range of Memory map

Value – 16bit data

E.g. W E940 0080 → Write P10_IOCR00 register with 0x80

Remark: 1) The Flash area is not able to be written

3.9 External Crystal

X - Switch the system clock source to the external crystal Osc. (May use the Oscilloscope to probe the XTAL1 and XTAL2 pins to verify)

3.10 Help

H – Display the Menu

4 Script Files

Script files are used to set pin configurations for different designs. Here is an example to configure P10.0 to P10.7 as outputs, set port pins to 1 and toggle alternate pins in 500msec and 1000msec via ASC or LIN.
Remark: ADC Read "A" and Measure Freq "F" commands are not supported in Script Files

Here is the script example to toggle P10.0 to P10.7

```
# Start
c 10 0 0
c 10 1 0
c 10 2 0
c 10 3 0
c 10 4 0
c 10 5 0
c 10 6 0
c 10 7 0
O 10 0 1
O 10 1 1
O 10 2 1
O 10 3 1
O 10 4 1
O 10 5 1
O 10 6 1
O 10 7 1
t 10 0 100
t 10 1 200
t 10 2 100
t 10 3 200
t 10 4 100
t 10 5 200
t 10 6 100
t 10 7 200
! End
```

Scripts can be loaded using Hyperterminal or MTTY.

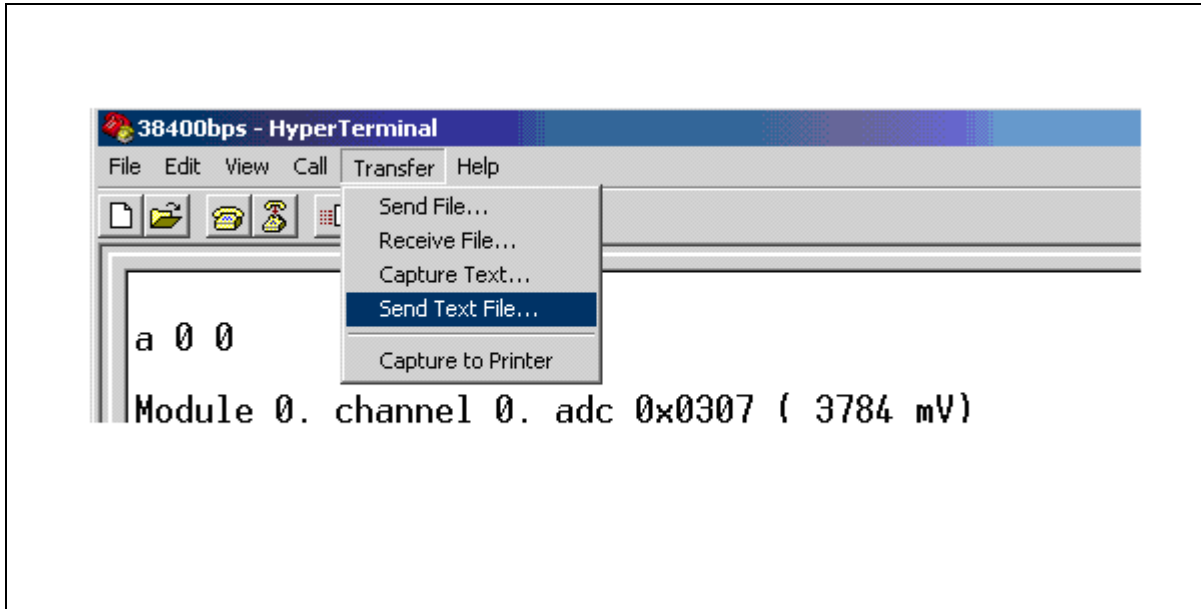


Figure 4 Loading Scripts with Hyper Terminal.

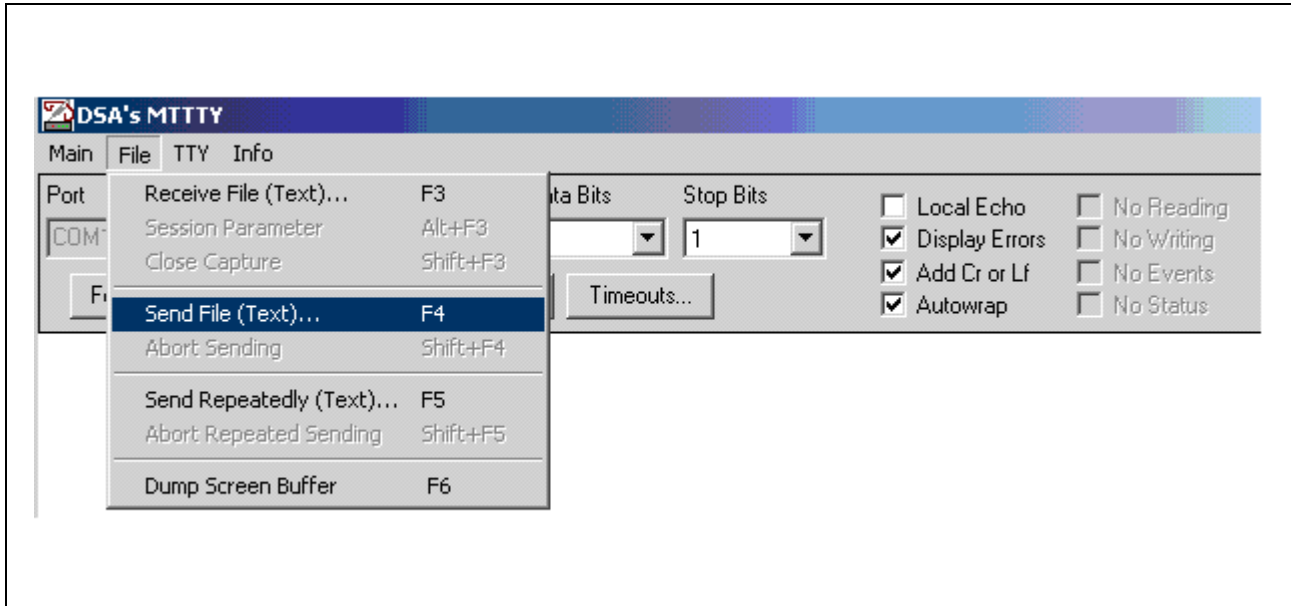


Figure 5 Loading Scripts with MTTY.

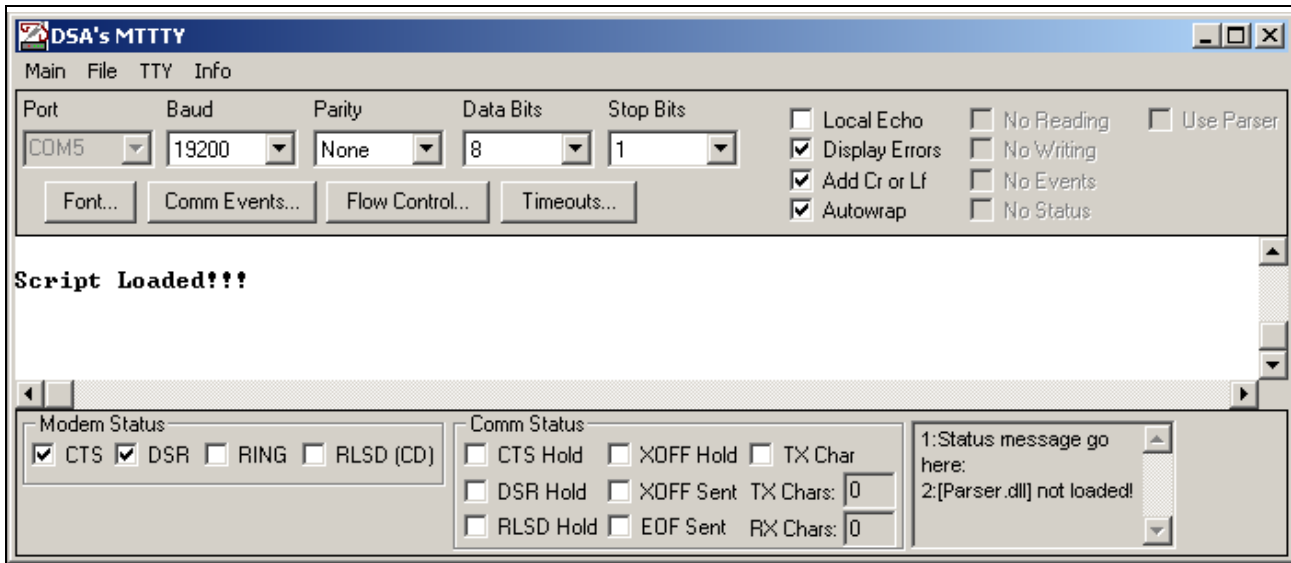


Figure 6 Success of loading Scripts with MTTY.

5 Glossary

SFR	Special Function Register
ADC	Analog to Digital Converter
ASC	Asynchronous Serial Channel
USIC	Universal Serial Interface Channel
RS232	Recommended Standard 232
UART	Universal Asynchronous Receiver/Transmitter
LIN	Local Interconnect Network

6 Appendix

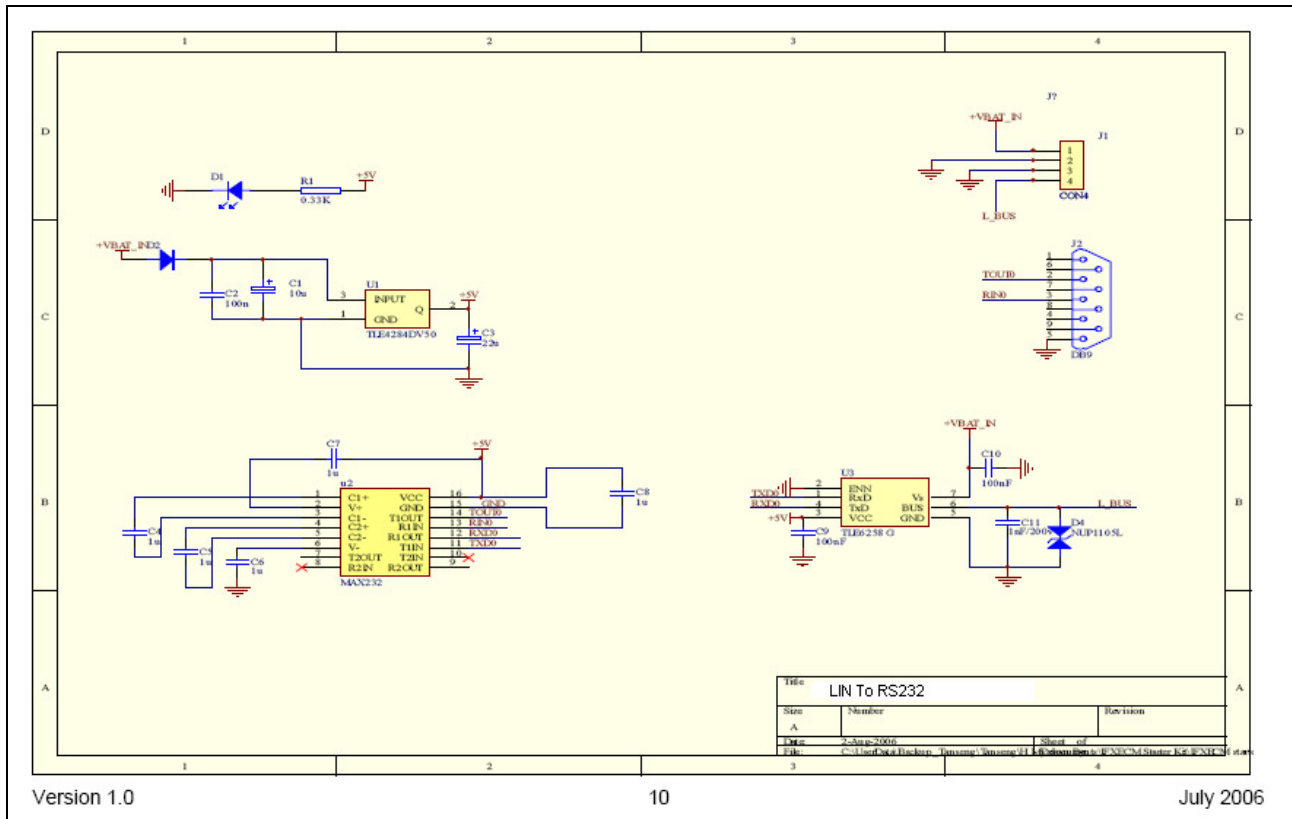


Figure 7 LIN to RS232 Transceiver Schematic.

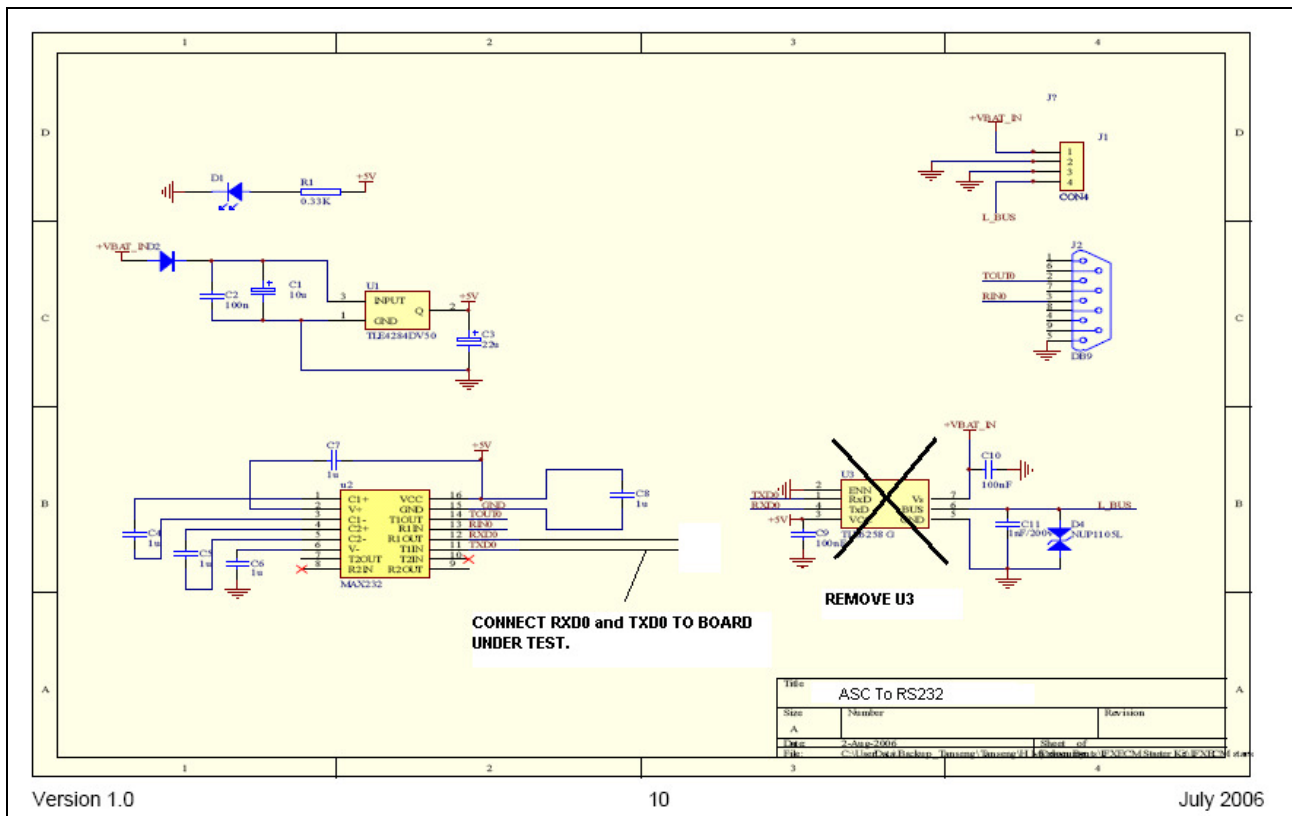


Figure 8 ASC to RS232 Transceiver Modified From LIN to RS232 Transceiver

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